REMARKS

In the Office Action, the Examiner rejected claims 1-32. By the present Response, Applicants have amended claims 1-32 for clarification of certain features in order to expedite allowance of the present application. These amendments do not add any new matter. Upon entry of these amendments, claims 1-32 will be pending in the present application and are believed to be in condition for allowance. In view of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration and allowance of all pending claims.

Objections to the Specification

In the Office Action, the Examiner set forth several objections to the specification. First, the Examiner stated:

> The disclosure is objected to because of the following informalities: the specification recites, in various places, both "motion correction factors 106" and "motion compensation factors 106". Applicant is advised to amend the specification to recite "motion compensation factors" throughout the entire disclosure in order to maintain consistency with the claim language.
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> Office Action, page 2.

As indicated above, Applicants have amended the paragraphs of the specification which recite "motion correction factors" to recite "motion compensation factors," as requested by the Examiner. In view of these amendments, Applicants respectfully request that the Examiner withdraw the objection to the specification.

Second, the Examiner objected to the language and format of the Abstract. Specifically, the Examiner objected to the Abstract based on M.P.E.P. § 608.01(b) for including more than 150 words. By the present Response, Applicants have amended the Abstract to comply with the 150 word limit set forth under Section 608.01(b) of the M.P.E.P. Accordingly, Applicants respectfully request that the Examiner also withdraw the objection to the Abstract.

Claim Rejections under 35 U.S.C. § 101

The Examiner rejected claims 1-4, 9-12, 17-20, and 25-28 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. Specifically, the Examiner stated that:

> Claims 1, 2, 9, 10, 17, 18, 25, and 26 are directed toward a method of processing image data, the steps of which comprise the mere manipulation of electromagnetic signals. Such manipulation of electromagnetic signals has been previously held to constitute a judicial exception which may only be deemed statutory only if the claimed method(s) produce a useful, tangible and concrete result and are sufficiently tied to another statutory class. The instant claims are not sufficiently tied to an apparatus or other statutory class.
>
> Similarly, the computer programs of claims 3, 4, 1, 12, 19, 20, 27 and 28 constitute nothing more than methods which fail to produce a concrete, tangible and useful result; that they are embodied on computer readable media does not cure this deficiency.
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> Office Action, page 3.

Applicants respectfully traverse this rejection.

Legal Precedent

In setting forth the present rejection under Section 101, the Examiner appears to have analyzed independent claims 1-4, 9-12, 17-20, and 25-28 in view of the "useful, tangible, and concrete result" test previously established in *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, 149 F.3d at 1368 (Fed. Cir. 1998). Applicants respectfully submit that the "useful, tangible, and concrete result" standard used by the Examiner in determining whether independent claims 1-4, 9-12, 17-20, and 25-28 recite statutory subject matter is incorrect in view of the recent Federal Circuit decision in the case of *In re Bilski*, No. 2007-1130, (Fed Cir. Oct. 30, 2008) (*en banc*).

In *Bilski*, the Federal Circuit explored the origins of several legal standards previously adopted for assessing the patentability of methods or processes under Section 101, including the "useful, tangible, and concrete result" test. *See id.* slip op. at 19-20. After consideration, the Federal Circuit concluded:

> ...while looking for a "useful, tangible and concrete result" may in many instances provide useful indications of whether a claim is drawn to a fundamental principle or a practical application of such a principle, that inquiry is insufficient to determine whether a claim is patent-elibigle under § 101. And it was certainly never intended to supplant the Supreme Court's test. Therefore, we also conclude that the "useful, concrete and tangible result" inquiry is inadequate and reaffirm that the machine or transformation test outlined by the Supreme Court is the proper test to apply.
>
> *Id.* at 20. (Emphasis added.)

In addition to rejecting the "useful, tangible and concrete result" test as being a proper standard for assessing the patentability of process or method claims under Section 101, the Federal Circuit also reiterated the guidelines for applying the proper "machine or transformation" test. Specifically, the Federal Circuit stated:

> The machine-or-transformation test is a *two-branched* inquiry; an applicant may show that a process claim satisfied § 101 either by showing that his claim is tied to a particular machine, or by showing that his claim transforms an article. *See Benson*, 409 U.S. at 70. Certain considerations are applicable to analysis under either branch. First, as illustrated by *Benson* and discussed below, the use of a specific machine or transformation of an article must impose meaningful limits on the claim's scope to impart patent-eligibility. *See Benson*, 409, U.S. at 71-72. Second, the involvement of the machine or transformation in the claimed process much not merely be insignificant extra-solution activity. *See Flook*, 437 U.S. at 590.
>
> *Id.* at 24. (Emphasis added.)

Indeed, the *Bilski* court has made it clear that if a claim directed to a method or a process is either tied to a machine or device, or performs a transformation of an article into a different state or thing, then the claimed method or process qualifies as statutory subject matter under Section 101.

Deficiencies of the Rejection

With the above legal tenets in mind, Applicants note that in the rejection of independent claims 1-4, 9-12, 17-20, and 25-28, the Examiner employed the "useful, tangible, and concrete result" test which, as discussed above, is now defunct. *See* Office Action, page 3. For at least this reason, Applicants respectfully submit that the Section 101 rejection is improper and request that the Examiner reconsider independent claims 1-4, 9-12, 17-20, and 25-28 in view of the machine-or-transformation test set forth in *Bilski.*

Applicants further submit that independent claims 1-4, 9-12, 17-20, and 25-28 would qualify as statutory subject matter under the machine-or-transformation test. In particular, Applicants note that all of these claims are directed to methods (including computer-implemented methods) for processing image data. Specifically, each of these claims recites the use of "at least one imaging device" for acquiring a set of image data representative of a region of interest (e.g., an organ). Each of these claims further recites the step of acquiring a set of motion data using one or more electrical and/or non-electrical sensors. Applicants submit that the recited imaging device and electrical/non-electrical sensors clearly qualify as machines to which the claimed processes are tied. For instance, as discussed above, the machine-or-transformation under *Bilski* requires that the machine or machines to which a claimed process is tied impose a meaningful limit on the claim of the scope. *See Benson*, 409, U.S. at 71-72. Further, the use of the machine must constitute more than insignificant extra-solution activity. *See id.* (quoting *Flook*, 437 U.S. at 590). With these points in mind, Applicants submit that the claimed methods and processes rely on the very nature in which image and motion data is acquired using the particularly recited combinations of machines, namely the imaging devices and electrical/non-electrical sensors set forth in claims 1-4, 9-12, 17-20, and 25-28. Further, the image and motion data acquired from the imaging devices and electrical/non-electrical sensors,

respectively, are used in image processing to generate an image having reduced motion artifacts. Thus, the imaging devices and electrical/non-electrical are machines or devices that clearly impose meaningful limits and are significantly tied to the achievement of a particular result (e.g., processing/generation of an image) from the processes recited by claims 1-4, 9-12, 17-20, and 25-28. For at least this reason, Applicants respectfully assert that independent claims 1-4, 9-12, 17-20, and 25-28 satisfy the "tied to a machine" prong of the machine-or-transformation test set forth in *Bilski* and, therefore, recite statutory subject matter under Section 101. Accordingly, Applicants respectfully request that the Examiner withdraw the Section 101 rejection of independent claims 1-4, 9-12, 17-20, and 25-28.

Claim Rejection Under 35 U.S.C. § 112, First Paragraph

In the Office Action, the Examiner rejected claims 1-32 under 35 U.S.C. § 112, first paragraph, for failing to comply with the enablement requirement. Applicants respectfully traverse this rejection.

Legal Precedent

Regarding the enablement requirement, the Examiner has the initial burden to establish a *reasonable basis* to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 U.S.P.Q.2d 1510, 1513 (Fed. Cir. 1993). The test for enablement, as set forth by the Supreme Court, is whether the experimentation needed to practice the invention is undue or unreasonable. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916). A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 U.S.P.Q.2d 1331, 1332 (Fed. Cir. 1991). The *undue experimentation* test essentially evaluates whether one of reasonable skill in the art can make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. *U.S. v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988). As long as the specification discloses at least one method for making and using the claimed invention that bears a *reasonable correlation* to the entire scope of the claim, then the enablement requirement of Section 112 is satisfied. *In re Fisher*, 427 F.2d 833, 839, 166

U.S.P.Q. 18, 24 (C.C.P.A. 1970). The specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation. *In re Borkowski*, 422 F.2d 904, 908, 164 USPQ 642, 645 (C.C.P.A. 1970).

Deficiencies of the Rejection

Independent claims 1-32 each recite the determination/extraction of one or more "motion compensation factors" which may used in the processing of image data. Particularly, the recited motion compensation factors may be used in conjunction with retrospective gating points in order to generate images having reduced motion artifacts. The Examiner's rejection of independent claims 1-32 under Section 112, first paragraph, appears to be based on the assumption that the specification fails to adequately enable persons skilled in the art to practice the present invention using the recited "motion compensation factors." Specifically, the Examiner stated:

> Claims 1-32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1-32 recite "motion compensation factors" which were not described in the disclosure in sufficient detail such that one of ordinary skill in the art would be reasonably apprised of how to use and make the claimed invention. The specification lacks any and all specific description of exactly what a motion compensation factor is, or precisely how it is derived, other than the generalized statement that the determination of the factors "may involve modeling the anticipated motion" (Specification p. 18 paragraph 3). For the purposes of further examination herein, Examiner interprets "motion compensation factor" to mean any quality or characteristic related to motion of the imaged objects.
>
> Office Action, page 3.

Applicants respectfully traverse this rejection. First, Applicants respectfully disagree with the Examiner's position that the specification fails to provide a specific description of how motion compensation factors are derived. The present application clearly states that in addition to the extraction of retrospective gating points from the sensor-acquired motion data, motion compensation factors may also be extracted for image processing. *See* Application, page 18, line 24 to page 19, line 3; *see also* FIG. 4. The application clearly discloses that the recited motion compensation factors may be determined non-iteratively using organ motion models based on a priori (motion is previously known) data or may be extracted using iterative algorithms applied to the sensor-acquired motion data itself (e.g., motion was not previously known). *See id.* Based on at least these teachings, Applicants assert that one of reasonable skill in the art would be able to practice the image processing techniques set forth in the present application without undue experimentation and, therefore, independent claims 1-32 satisfy the enablement requirement under Section 112, first paragraph. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916); *see also U.S. v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988).

Second, even if the above description could be considered a "generalized statement" failing to provide specific examples, as alleged by the Examiner, the former Court of Customs and Patent Appeals has held that the "specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation." *In re Borkowski*, 422 F.2d 904, 908, 164 USPQ 642, 645 (C.C.P.A. 1970). Thus, in order to maintain the present rejection based on this reasoning, the Examiner would be required to make a showing that a person skilled in the art would be required to perform an undue amount of experimentation in order to practice the image processing techniques using motion compensation factors, as described in the present application. However, other than general allegations, it does not appear that the Examiner has offered any evidence showing that undue experimentation would be required in order for one skilled in the art to utilize motion compensation factors in conjunction with the image processing techniques set forth in Applicants' disclosure. To the contrary, Applicants submit that persons skilled in the

art having the benefit of Applicants' disclosure will readily appreciate that various motion compensation factors could be extracted from models for organ motion and utilized in processing image data pertaining to a particular organ to generate images having reduced motion artifacts.

For at least the reasons discussed above, Applicants respectfully request withdrawal of the rejection of claims 1-32 under 35 U.S.C. § 112, first paragraph.

Claim Rejections Under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 1-8 under 35 U.S.C. § 102(b) as being anticipated by Spraggins et al., U.S. Patent No. 4,961,426 (hereinafter "Spraggins"). The Examiner further rejected claims 1-8 under 35 U.S.C. § 102(e) as being anticipated by Larson et al., U.S. Pre-Grant Publication No. 2004/0155653 (hereinafter "Larson"). Applicants respectfully traverse this rejection.

Legal Precedent

Anticipation under Section 102 can be found only if a single reference shows exactly what is claimed. *See Titanium Metals Corp. v. Banner*, 227 U.S.P.Q. 773 (Fed. Cir.1985). For a prior art reference to anticipate under Section 102, every element of the claimed invention must be identically shown in a single reference. *See In re Bond*, 15 U.S.P.Q.2d 1566 (Fed. Cir.1990). That is, the prior art reference must show the *identical invention "in as complete detail as contained in the ... claim*" to support a *prima facie* case of anticipation. *Richardson v. Suzuki Motor Co*., 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989) (emphasis added). Thus, for anticipation, the cited reference must not only disclose all of the recited features but must also disclose the *part-to-part relationships* between these features. *See Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 486 (Fed. Cir.1984). Accordingly, Applicants need only point to a single element or claimed relationship not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter.

Deficiencies of Larson

Independent claims 1-8 are directed towards various methods and systems, as well as computer readable media storing a computer program, all of which reflect various embodiments of the present invention. Applicants note, however, that independent claims 1-8, as amended, each commonly recite the acquisition of a set of image data using *at least one imaging device* as well as the substantially concurrent acquisition of a set of motion data for two or more *types of* organs using sensor-based measurement systems, which may comprise either electrical or non-electrical sensors, wherein the sensor-based measurement systems (e.g., electrical sensors and/or and non-electrical sensors) are separate from the recited imaging device for acquiring the recited image data. Amended independent claims 1-8 further clarify that the recited two or more types of organs *each perform different physiological functions*. These features do not appear to be taught or suggested by Larson, which is generally directed towards a technique for extracting motion data *directly* from image data, thus obviating the need for using additional sensors for acquiring motion data.

First, Larson does not appear to disclose the acquisition of motion data for two or more types of organs using at least one of one or more types of electrical sensors *or* at least one of one or more types of non-electrical sensors, as generally recited by amended independent claims 1-8. In contrast, Larson teaches that organ motion data may be derived *directly* from image data acquired using an imaging device, specifically a magnetic resonance (MR) imaging device. *See* Larson, Abstract, paragraphs 10, 14, 25, and 35. The Examiner's rejection of independent claims 1-8 appears to be based on the assumption that an imaging device (e.g., the MR imaging system of Larson) could include sensors, and thus simultaneously qualify as being an imaging device *and* an electrical sensor. Although Applicants do not agree that the Examiner's interpretation of Larson is reasonable, particularly when the imaging device and the sensors are recited *separately* in the claims, Applicants note that the amended independent claims 1-8 *clearly* recite that the electrical/non-electrical sensors are separate from the imaging device. In other words, even if the MR imaging system taught in Larson could be construed as including sensors, such sensors would not be separate from the MR imaging device. Accordingly,

Applicants submit that Larson appears to be deficient with regard to this recited feature. Further, to the extent that Larson briefly mentions the use of an electrocardiogram (ECG – a well known type of electrical sensor) for acquiring cardiac motion data of a heart, Applicants submit that this teaching alone fails to disclose the use of electrical or non-electrical sensors for acquiring motion data from two or more types of organs because a heart is only a *single* organ. *See id.* at paragraphs 3 and 24.

Second, even if Larson could somehow be characterized as teaching the acquisition of motion data using electrical or non-electrical sensors that are *separate* from the MR imaging system, Larson still fails to disclose that motion data is acquired for two or more *types of* organs which perform *different physiological functions*, as further recited by amended independent claims 1-8. In setting forth the present rejection, the Examiner appears to have taken the position that the extraction of motion data for a pair of human lungs constitutes *two* organs. Even assuming this interpretation is reasonable, Applicants note that the amended independent claims 1-8 require that the two or more organs are of different types which perform different physiological functions. In sharp contrast, a pair of lungs would constitute the *same* type of organ and each lung would perform the *same* physiological function (e.g., breathing and providing oxygen to blood). As such, Applicants respectfully submit that Larson also appears to be deficient with regard to the acquisition of motion data for *two or more types of organs* that perform *different physiological functions*, as recited by amended independent claims 1-8.

In view of these deficiencies, among others, no *prima facie* case of anticipation is believed to exist with regard to independent claims 1-8 in view of Larson. Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 102(e) of independent claims 1-8.

Deficiencies of Spraggins

Spraggins is generally directed towards various techniques for nuclear magnetic resonance (NMR) imaging in which organ motion data is derived or extracted *from* image data

(e.g., without the use of separate sensors). Indeed, the problem addressed by Spraggins is similar to that of Larson. That is, Spraggins is concerned with the drawbacks in using ECG (e.g., an electrical sensor) devices in conjunction with NMR imaging systems. For instance, Spraggins notes that the use of ECG sensors is unsatisfactory and not desirable because the intense magnetic fields and pulsed magnetic field gradients associated with NMR imaging often interfere with a patient's ECG signal. *See* Spraggins, col. 1, lines 20-35. As will be discussed below, Spraggins also appears to be missing the features discussed above with regard to the rejection of independent claims 1-8 based on Larson.

First, Applicants do not believe that Spraggins discloses the acquisition of motion data for two or more types of organs using at least one of one or more types of electrical sensors *or* at least one of one or more types of non-electrical sensors, as generally recited by amended independent claims 1-8. In contrast, Spraggins appears to teach that organ motion data may be derived *directly* from "NMR non-imaging data." *See* Spraggins, col. 4, line 47-55. It should be noted that Spraggins *clearly* defines the term "NMR non-imaging data" to mean *image data* acquired using an NMR imaging device when a phase-encoding amplitude is constant (e.g., invariant). *See id.* at col. 4, lines 8-12. In other words, Spraggins is abundantly clear that motion data is derived or extracted *directly* from at least portions of the NMR image data referred to as "NMR non-imaging data" (e.g., portions in which the phase-encoding amplitude is constant).

In setting forth the present rejection, the Examiner alleged that Spraggins discloses the acquisition of a set of NMR image data of a heart *and* the acquisition of motion and timing data for a pair of human lungs using separate non-imaging NMR data. *See* Office Action, page 4. Here again, the Examiner's rejection of independent claims 1-8 appears to be based on the assumption that the disclosed NMR imaging device of Spraggins could simultaneously be characterized as being both an imaging device *and* an electrical sensor. However, as discussed above, independent claims 1-8, as amended, *clearly* recite that the electrical/non-electrical sensors are separate from the imaging device. Thus, even if the NMR imaging system taught by Spraggins could reasonably be characterized as including sensors, these sensors would be a

component of the NMR imaging device. They would not be separate from the imaging device, as required by amended independent claims 1-8. Accordingly, Applicants do not believe that Spraggins can be reasonably interpreted as disclosing electrical/non-electrical sensors for acquiring motion data, wherein the electrical/non-electrical sensors are separate from the NMR imaging device.

Further, even if Spraggins could somehow be characterized as teaching the acquisition of motion data using electrical or non-electrical sensors that are separate from the disclosed NMR imaging device, Spraggins still fails to disclose that motion data is acquired for two or more *types of* organs which perform *different physiological functions*, as further recited by amended independent claims 1-8. With regard to this recited feature, the Examiner again characterized a pair of human lungs as constituting *two* organs. As discussed above, even assuming such an interpretation is reasonable, the amended independent claims 1-8 require that the two or more organs are of different types and perform different physiological functions. In sharp contrast, the human lungs cited by the Examiner would constitute the *same* type or organ and would perform the *same* physiological function. Therefore, Applicants respectfully submit that Spraggins also appears to be deficient with regard to the acquisition of motion data for *two or more types of organs* that perform *different physiological functions*.

In view of these deficiencies, among others, no *prima facie* case of anticipation is believed to exist with regard to independent claims 1-8 in view of Spraggins. Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 102(b) of independent claims 1-8.

Claim Rejections Under 35 U.S.C. § 103

In the Office Action, the Examiner rejected claims 9-32 under 35 U.S.C. § 103(a) as being unpatentable over Larson in view of Rogers, U.S. Patent No. 5,477,144 (hereinafter referred to as "Rogers"). The Examiner also rejected claims 9-32 under 35 U.S.C. § 103(a) as

being unpatentable over Spraggins in view of Rogers. Applicants respectfully traverse these rejections.

Legal Precedent

The burden of establishing a prima facie case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). In addressing obviousness determinations under 35 U.S.C. §103, the Supreme Court in *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007), reaffirmed many of its precedents relating to obviousness including its holding in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). In *KSR*, the Court also reaffirmed that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *Id.* at 1741. In this regard, the *KSR* court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does … because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *Id.* Furthermore, the *KSR* court did not diminish the requirement for objective evidence of obviousness. *Id.* ("To facilitate review, this analysis should be made explicit. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness")). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ."); *see also In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002) (holding that the factual inquiry whether to combine references must be thorough and searching, and that it must be based on *objective evidence* of record).

Further, when prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight

gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Federal Circuit has warned that the Examiner must not, "fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." *In re Dembiczak*, F.3d 994, 999, 50 U.S.P.Q.2d 52 (Fed. Cir. 1999) (quoting *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983)).

Additionally, Applicants note that it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. §2145. Moreover, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); see M.P.E.P. §2143.01(VI). If the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); see M.P.E.P. §2143.01(V).

Independent Claims 9-16: The cited references, alone or in combination, fail to disclose all the recited elements.

Independent claims 9-16 are directed towards various methods and systems, as well as computer readable media storing a computer program, all of which reflect various embodiments of the present invention. Applicants note, however, that claims 9-16 each commonly recite the acquisition of image data using at least one image device and the acquisition of motion data for a respiratory organ (e.g., a lung) using both electrical *and* non-electrical sensors that are separate from the recited imaging device. Applicants respectfully submit that both the combination of

Larson and Rogers and the combination of Spraggins and Rogers fail to disclose at least these recited features.

1. Deficiencies of Larson and Rogers

As discussed above, the *only* sensor disclosed in Larson which is separate from the MR imaging system appears to be an ECG for measuring cardiac data for a heart, which would not qualify as a sensor for acquiring respiratory motion data. *See* Larson, paragraph 63. Thus, Applicants do not believe that Larson discloses both electrical and non-electrical sensors for acquiring respiratory motion data, such that the sensors are separate from the MR imaging system, as recited by independent claims 9-16. Further, Applicants do not believe that the Rogers reference cures the deficiencies of Larson.

As noted in the previous Response filed on May 16, 2008 (hereinafter "the Previous Response"), the Rogers reference generally discusses the use of pressure transducers, acoustic microphones, piezoelectric crystal transducers, strain gauges, and air flow meters for measuring cardiac or respiratory motion. *See* Rogers, col. 5, lines 53-63. These devices are all *non-electrical* sensors. That is, the underlying phenomena (pressure, acoustics, strain, air flow) measured by such devices are all *non-electrical* in nature, a fact readily acknowledged by the Examiner. *See* Final Office Action mailed June 20, 2007, page 7, lines 7-8 (the Examiner stating that a pressure transducer, acoustic microphone, and piezoelectric crystal transducer are all non-electrical sensors). Assuming these devices could be characterized as the recited non-electrical sensor for acquiring respiratory motion data, Applicants submit that Rogers still fails to disclose an electrical sensor separately from an imaging device for acquiring respiratory data. To the extent that Rogers does briefly mention that an RF-coil, which is a well-known component of an MR imaging device, may be used for acquiring respiratory motion data, the RF-coil could not reasonably be characterized as being an electrical sensor that is separate from an MR imaging system. *See* Rogers, col. 5, lines 59-61. Thus, even assuming that the Examiner's combination of Larson and Rogers is proper, the proposed combination is still deficient with regard to the use

of an electrical sensor that is separate from an imaging device and configured to acquire respiratory motion data, as recited by amended independent claims 9-16.

2. Deficiencies of Spraggins in combination with Rogers

As mentioned above, Spraggins generally discloses a technique for using an NMR imaging system to acquire image data and deriving organ motion data directly from certain portions of the acquired image data (e.g., those over which a phase-encoding amplitude is constant). However, other than the NMR imaging system, Spraggins does not appear to disclose separate electrical and non-electrical sensors for acquiring respiratory motion data. Moreover, Applicants do not believe that Rogers obviates these deficiencies.

As discussed above, Rogers appears to disclose a variety of non-electrical sensors (e.g., pressure transducers, acoustic microphones, piezoelectric crystal transducers, strain gauges, and air flow meters) that are separate from an imaging device and configured to acquire motion data for a cardiac or a respiratory organ. However, it does not appear Rogers also discloses a separate electrical sensor for acquiring respiratory motion data. To the contrary, the only electrical sensing component disclosed by Rogers is an RF-coil which, as discussed above, is described as being part of an MR imaging system. Therefore, even assuming that the Examiner's combination of Spraggins and Rogers is proper, the proposed combination is still deficient with regard to the use of a separate electrical sensor for acquiring respiratory motion data, as recited by amended independent claims 9-16.

Independent Claims 17-32: The proposed combination of Larson and Rogers and the proposed combination of Spraggins and Rogers is improper.

With regard to the remaining Section 103 rejections of independent claims 17-32, Applicants note that the Examiner rejected these claims in view of the combination of Larson and Rogers as well as the combination of Spraggins and Rogers. Although Applicants do not necessary agree that the proposed combinations disclose each and every element recited by independent claims 17-32, Applicants respectfully assert that the Section 103 rejections of

claims 17-32 are improper because Larson and Spraggins both teach away from Rogers. Instead, the Examiner's proposed combination of these references appears to be based on impermissible hindsight, which is insufficient to support a *prima facie* obviousness rejection. That is, when prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988).

With the foregoing in mind, Applicants note that the problems addressed by Larson and Spraggins are similar. That is, both of these references are generally concerned with the drawbacks associated in using sensors in conjunction with imaging devices, especially when the imaging techniques employed utilize intense magnetic fields (e.g., in MR and NMR imaging) which may cause severe interference with regard to sensed motion data. Thus, Larson and Spraggins both offer solutions in which motion data may be derived directly from the acquired image data itself, thus obviating the need for separate sensors to acquire motion data. For instance, Larson states that motion data may be derived or extracted directly from the MR image data itself, such as by analyzing raw k-space or transformed k-space data. *See* Larson, paragraph 17. Similarly, Spraggins discloses that motion data may be extracted directly from image data acquired using an NMR imaging system. Particularly, Spraggins notes that the motion data should be extracted from portions of NMR image data in which a phase-encoding amplitude value is invariant or constant. *See* Spraggins, col. 3, line 42 – col. 4, line 55. Indeed, Larson and Spraggins both disclose a technique in which the need for separate sensors in acquiring motion data during an imaging process is obviated.

Keeping these points in mind, Applicants re-emphasize that Larson and Spraggins fail to disclose non-electrical sensors which are separate from an imaging device and are configured to acquire motion data for either a cardiac or respiratory organ. Moreover, in view of the teachings of Larson and Spraggins summarized above, Applicants respectfully submit that a person skilled

in the art would not find it obvious to modify either Larson or Spraggins in the manner suggested by the Examiner to include the non-electrical sensors (e.g., pressure transducer, acoustic microphone, etc.) disclosed in Rogers. That is, the inventions described in Larson and Spraggins are directed to solutions in medical imaging that obviate or eliminate the need for motion sensors, and thus remove the complexity of dealing with sensors when performing image acquisition. However, the Examiner's proposed modification of incorporating the non-electrical sensors of Rogers into the imaging techniques and imaging systems disclosed by Larson and Spraggins does not remove the complexity involved in acquiring motion and image data concurrently, but may in fact exacerbate it. Accordingly, Applicants assert that the Examiner's proposed combinations of references are based on impermissible hindsight reconstruction in which the Examiner has simply picked and chosen from isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). As such, Applicants respectfully submit that proposed combination of Larson and Rogers and the proposed combination of Spraggins and Rogers, as cited by the Examiner, is improper. Therefore, no *prima facie* case of obviousness is believed to exist with regard to independent claims 17-32.

For at least the reasons discussed above, no *prima facie* case of obviousness is believed to exist with regard to independent claims 9-32. Accordingly, Applicants respectfully request withdrawal of the rejection under 35 U.S.C. § 103(a) of independent claims 9-32.

Claim Rejections under Doctrine of Obviousness-Type Double Patenting

In the Office Action, the Examiner rejected claims 1-16 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-8 and 17-24 of co-pending Application No. 10/723,857. *See* Office Action, pages 7-8. Although Applicants do not necessarily agree that the present claims 1-16 are obvious over claims 1-8 and 17-24 of co-pending Application No. 10/723,857, Applicants are willing to file a terminal disclaimer, if necessary, when the present claims are indicated as allowable. Accordingly, Applicants respectfully request that the

Examiner hold the obviousness-type double patenting rejection in abeyance until the present claims are indicated as allowable.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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/John Rariden/

John M. Rariden
Reg. No. 54,388
FLETCHER YODER
P.O. Box 692289
Houston, TX 77269-2289
(281) 970-4545